

APPLICATION FOR UNITED STATES PATENT

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INVENTION: Child Positioner for X-ray Photography

SPECIFICATION

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1 CHILD POSITIONER FOR X-RAY PHOTOGRAPHY

2 FIELD OF THE INVENTION

3 [0001] The present invention relates to a child positioning  
4 apparatus for X-ray photography or imaging and more particularly  
5 to a child positioning apparatus for X-ray photography with  
6 adjustable dial lock features an improved upright latch and  
7 adjustment.

8 BACKGROUND OF THE INVENTION

9 [0002] An X-ray positioner for an upright child is first  
10 described in U.S. Pat. No. 3,051,832 (`832) issued to Jalmer  
11 Pigg, Sr. on Aug. 28, 1962, the contents of which are  
12 incorporated herein by reference. While the device described in  
13 the `832 patent was effective in the upright positioning of a  
14 child being X-rayed, there were several shortcomings in its  
15 operation.

16 [0003] A significant problem with the `832 invention was the  
17 complex method used to adjust the position of the X-ray film  
18 cassette relevant to the position of the patient. As best seen in  
19 Figure 1, the `832 film positioner 100 principally comprised film  
20 carriage 104 which included hooks 101 with the X-ray cassette 103  
21 resting on the hooks 101. Film positioner 100 had rear side  
22 tracks (not shown) which extended to the rear of the L-angle 108.  
23 Latch 105 in the `832 patent was employed to secure carriage 104

1 in position after having been adjusted upward or downward by an  
2 X-ray technician. In tightening the latch 105, the hard surface  
3 of the latch 105 was tightened against the hard surface of the  
4 rear tracks 106 of the carriage 104. To create adequate friction  
5 between the two hard surfaces the latch 105 was often  
6 over-tightened, placing great stress on mounting pin 109 and  
7 resulting in frequent breakage. A similar mechanism was used on  
8 the shield and indicia device located on the front of the child  
9 positioner, also shown in Figure 1 as 110.

10 [0004] A subsequent patent, U.S. Patent No. 5,600,702 (`702)  
11 attempted to resolve these latching issues by adding pads at the  
12 end of the latch to increase friction between the latch and the  
13 film holder. As best seen in Figure 2, friction pads 107 were  
14 added to the end of the latch against the sidetracks of the  
15 carriage 104 to attempt to obviate the necessity of  
16 over-tightening the latch. Similarly, friction pads 107 were  
17 added to latch 111 that secures indicia plate 112 into position.  
18 While the problem of ineffective latching is mitigated by this  
19 improvement, the process remains unwieldy and generally requires  
20 the use of two hands to adjust the position of the X-ray film  
21 cassette. One hand is used to hold the cassette carriage while  
22 another hand operates the latching mechanism.

23 [0005] A second problem not addressed by either U.S. Patent  
24 No. 3,051,832 or U.S. Patent No. 5,600,702 is the difficulty

1 associated with placing the child in the positioner while  
2 adjusting the left and right upright restraints in place around  
3 the child. Formerly, the uprights were secured to the carousel  
4 by sliding a wedge attached to the upright by an L-bracket, into  
5 a slide block by passing the wedge over a pop-up button. The  
6 upright would then be held in place as the pop-up button  
7 released, blocking passage of the wedge out of the slide block.  
8 Over time, these pop-up buttons have tended to become  
9 increasingly less responsive, permitting the wedges to slide out  
10 of the slide blocks at inopportune times. The pop-up button  
11 fastener is particularly problematic when, over time, the pop-up  
12 button wears a groove on the bottom of the slide block. In this  
13 instance the pop-up button begins to rest at the bottom of the  
14 wear-groove and the wedge is able to slide out of the channel  
15 unimpeded.

#### 16 SUMMARY OF THE INVENTION

17 [0006] It is therefore an object of the invention to provide  
18 an upright child positioning apparatus for X-ray photography with  
19 improved adjustment mechanisms.

20 [0007] It is a further object of the invention to provide a  
21 child positioning apparatus with improved placement and locking  
22 of the left and right upright restraint members

23 [0008] The present invention provides for these and other  
24 objectives with at least three material advantages over the prior  
25 art. First, the invention uses an X-ray film cassette positioning

1 system that can be operated by using a single hand. The film  
2 cassette is restrained in position by two friction fasteners such  
3 as dial knobs. One dial knob restrains the film cassette  
4 vertically and a second dial knob restrains the cassette  
5 horizontally. Second, a similar positioning system is used to  
6 hold the position of the shield and indicia plate. A single dial  
7 knob maybe used to hold the position of the shield on which the  
8 various indicia markers are placed. Third, the upright restraints  
9 are more securely held in place with improved fasteners at the  
10 ends of the channels of the slide block and an improved strap  
11 assembly. In addition, a new turntable locking mechanism has  
12 been devised.

#### BRIEF DESCRIPTION OF THE DRAWINGS

14 [0009] Figure 1 is a side plan view of the positioner  
15 according to the prior art.

16 [0010] Figure 2 is a side view of the positoner according to  
17 the prior art including the friction pads, where the dotted line  
18 shows the position that would be occupied by the body of a small  
19 child supported in the positioner.

20 [0011] Figure 3 is a perspective view of the present  
21 invention.

22 [0012] Figure 4 is a perspective view of the film cassette  
23 positoner of the present invention.

24 [0013] Figure 5a is a top plan view of the slide block of the  
25 present invention.

1 [0014] Figure 5b is a cut-away view of the slide block showing  
2 the spring mechanism.

3 [0015] Figure 6a is a top view of the present invention with  
4 upright restraints removed.

5 [0016] Figure 6b is a top view of the present invention with  
6 upright restraints engaged.

7 [0017] Figure 7 is a side plan view of the upright restraints  
8 of this invention with strap portions engaged.

9 [0018] Figure 8 is an exploded perspective view of the  
10 positioner for the indicia plate and shield.

11 [0019] Figure 9a is a top view of the lock disengaged from the  
12 carousel.

13 [0020] Figure 9b is a top view of the lock engaging the  
14 carousel.

15 DETAILED DESCRIPTION OF THE INVENTION

16 [0021] The present invention is designed to improve the  
17 positioning of a child during X-ray photography. Referring now to  
18 the drawings in more detail. Figure 1 illustrates a prior art  
19 upright child positioner, which uses film positioner 100 with  
20 latch 105 to secure rear brackets of carriage 104 to L-angle 108  
21 after the X-ray film cassette 103 is positioned properly for  
22 taking an X-ray.

1     [0022]     Figure 2 illustrates an improved prior art child  
2     positioner in that the latch 105 has friction pad 107 to  
3     facilitate securing the rear tracks of carriage 104 to the  
4     L-angle 108. A similar friction pad 107 is used on the indicia  
5     latch 111.

6     [0023]     Figure 3 illustrates the child positioner of this  
7     invention. The child positioner 10 is based on top 50 stabilized  
8     by frame 55. The frame 55 is preferably made from stainless steel  
9     to prevent corrosion, and welded at its principal joints to  
10    prevent gradual wobbliness due to loose fasteners. Frame 55 also  
11    supports accessory tray 57 which can hold extra parts or  
12    accessories for the child positioner 10. For instance, accessory  
13    tray 57 may hold an additional pair of upright restraints to  
14    accommodate larger or smaller children. Wheels 59 attached to  
15    the frame 55 facilitate movement of the child positioner. A  
16    turntable in the form of carousel 16 sets in the center of the  
17    top 50. In a preferred embodiment, the carousel 16 and top 50  
18    are made of polyethylene so that little friction exists when  
19    turning the carousel 16. Ball bearings may be positioned between  
20    the top 50 and carousel 16 to facilitate rotation of the carousel  
21    16 relative to the top 50. In a more preferred embodiment the  
22    carousel 16 rests on ultra-high molecular weight polyethylene

1 (UHMW-PE) pads attached to the top 50 for even greater friction  
2 reduction. Because the carousel 16 is capable of being rotated  
3 with little resistance a preferred embodiment of the child  
4 positioner 10 contains a locking mechanism such as slide-lock 91.  
5 The slide lock 91 engages a selected lock hole 90 on the side of  
6 the carousel 16, which prevents the child movements from changing  
7 the position of the carousel 16 relative to the X-ray film  
8 cassette 15.

9 [0024] The carousel 16 holds right and left upright  
10 restraints 32, 30, best seen in Figure 7, in a removable fashion.  
11 An additional preferred feature of the present invention is  
12 upright restraint pads 44, which serve to cushion the upright  
13 restraints 30, 32 on top of the carousel 16 and to provide  
14 additional friction to prevent the upright restraints 30, 32 from  
15 slipping when positioned around a patient. The upright  
16 restraints 30, 32 are pivotably secured to the carousel 16 by  
17 slide block 40. Slide block 40, shown in Figure 5, uses spring  
18 loaded guides 42a, 42b to hold wedges 38a, 38b shown in Figure 6,  
19 in the slide block 40. Another preferred feature of the present  
20 invention is wing clamp 34 which serves to fix the upright wing  
21 braces 31a, 31b shown in Figure 6b, to the carousel 16. Clamps  
22 34 are rotated over wing braces 31a, 31b, thereby applying



1 downward pressure and forcing the wing braces 31a, 31b against  
2 the restraint pads 44, which preferably has a neoprene or other  
3 compressible synthetic surface.

4 [0024] The seat 49 is also supported by the carousel 16 and  
5 can be adjusted vertically to accomodate patients of varying  
6 height. The seat 49 is held in place by seat lock 52 which  
7 engages as a detent in one of a plurality of engagment contacts  
8 such as serations 33 of the seat stand 51. The seat lock 52 can  
9 be retracted to adjust the height of the seat 49 by pulling the  
10 lock trigger 54 which sets atop seat lock block 56. The locking  
11 mechanism also features lock cover 53 which guards against  
12 breaking the seat lock 52 when the seat 49 is inadvertantly  
13 adjusted without first pulling the lock trigger 54 to disengage  
14 the lock from the seat 49. The seat lock cover 53 serves to  
15 prevent the application of leverage that could be applied by an  
16 engaged seat lock 52 being moved by corresponding movement of the  
17 seat stand 51.

18 [0025] As shown in Figure 3, the X-ray film cassette 15,  
19 resting in tray 67, is properly positioned relative to seat 49 by  
20 film positioner 60. The film positioner 60 shown in detail in  
21 Figure 4, is attached to the table 50 by mounting block 61.  
22 Figure 4 illustrates the cassette positioner 60 in isolation.

1 The cassette block 61 is attached to the table 50 by wing bracket  
2 64b and a second matching opposite wing bracket (not shown)  
3 positioned on opposing sides of the cassette block 61. The  
4 horizontal portion of L-angle 62 is slidably positioned between  
5 cassette bracket guides 69a and 69b. A pass through friction  
6 fastener such as horizontal dial knob 65 may be loosened to  
7 permit movement of the L-angle 62 along horizontal groove 77,  
8 indirectly moving the X-ray film cassette 15 laterally with  
9 respect to the patient. Movement is facilitated by constructing  
10 the top layer of the mounting block out of UHMW-PE, or similar  
11 materials, thereby reducing friction between the mounting block  
12 61 and L-angle 62, obviating the need for ball bearings in that  
13 position. Another pass through friction fastener such as  
14 vertical dial knob 66 is used in a similar manner to move the  
15 tray 67 vertically through tray guides 68a and 68b along the  
16 vertical portion of L-angle 62 through vertical groove 78. The  
17 tray 67 is shown near its top position. The pass through  
18 fastener systems allows the X-ray technician to adjust the  
19 position of the X-ray film cassette 15 with a single hand. This  
20 is because a pass through fastener is activated (loosened or  
21 tightened) on the side of the adjusting carriage opposite tray  
22 67, yet passes through the vertical support to remain in  
23 communication with tray 67.

1     [0026]     Figure 5a is a top view of the slide block 40 as  
2     attached to the carousel 16 by fasteners such as screws 43. The  
3     slide block 40 contains a lengthwise channel 48 blocked by  
4     divider 41 creating channels 48a and 48b for receiving the  
5     upright restraint wedges 38a and 38b of the left and right  
6     restraints 30, 32 best seen in Figure 6b. The wedge 38a is  
7     received into channel 48a by pulling spring loaded guide 42a to  
8     compress the spring 45 and remove slide 46a from the end of  
9     channel 48a. Once the wedge 38a is positioned within channel 48a  
10    the spring-loaded guide may be released closing slide 46a and  
11    securing the left upright restraint 30. The spring-loaded guide  
12    42a can be easily opened by using the index finger, thereby  
13    removing the slide 46a from channel 48a.

14   [0027]     Figure 5b is a cut-away view of the spring-loaded  
15   mechanism for the slide block 40. Spring 45 is compressed when  
16   the spring-loaded guide 42 is drawn to remove slide 46 from the  
17   channel 48. When the spring 45 is compressed the channel 48 is  
18   cleared for receiving the wedge 38 of the upright restraint 30.  
19   As shown in Figure 6b, when the spring 45 is released the slide  
20   46 re-enters the channel 48 to block passage of the wedge 38  
21   thereby securing one end of the upright restraint 30 into  
22   position.

1    **[0028]** Figure 6a illustrates the child positioning apparatus 10  
2    from the top with the upright restraints 30, 32 removed. The  
3    carousel 16 is positioned parallel to the X-ray cassette 15 at a  
4    ninety degree angle as denoted by the numerals 115. The carousel  
5    can be locked into this position by lock 91 or further turned to  
6    either the forty-five or thirty degree angle positions and  
7    locked. The carousel has a plurality of lock holes 90, shown in  
8    Figure 3, appropriately located about the edge of the carousel  
9    for the lock 91 to engage and secure the carousel 16 at the  
10   designated angle positions. The positioner with the uprights  
11   removed shows the upright restraint pads 44 attached to the top  
12   of the carousel. The wing clamps 34 are attached to the carousel  
13   near the end of the upright restraint pads 44 opposite the slide  
14   block 40, and are shown openly positioned to receive the upright  
15   restraint wing braces 31.

16   **[0029]** Figure 6b illustrates the child positioning apparatus 10  
17   from the top with the upright restraints 30, 32 engaged. The  
18   wing clamps 34 are shown placed over the wing braces 31a, 31b in  
19   a closed position. The upright restraints are further restricted  
20   from movement by engagement in slide block 40. Figure 6b shows  
21   the wedge 38b held to the upright restraint 32 by L-bracket 39b.  
22   The wedge 38b is positioned between the slide 46b and the divider

1 41 locking one end of upright restraint 32 into position.

2 Upright restraint 30 is shown similarly fixed into position.

3 [0030] Figure 7 illustrates the upright restraints 30 and 32

4 with the patient 5 in place on the child positioner 10. The

5 first upright restraint 30 stands upright resting on L-bracket

6 39a. L-bracket 39a has wedge 38a attached and secured in slide

7 block 40. Wing brace 31a is secured by wing clamp 34. The

8 upright restraint 30 also has fasteners, such as snap 36,

9 attached. The fastening mechanism may comprise hook and loop

10 fasteners, but alternatives such as buckles and snaps may be

11 used. The second upright 32 has wing brace 31b and L-bracket

12 39b. L-bracket 39b has wedge 38b attached and secured in slide

13 block 40. Upright restraint 32 also has fasteners, such as,

14 buckle 35 attached to the upright restraint 32. The strap 37 can

15 be attached by connecting it at snap 35 on left upright 30 and

16 passing to the buckle on the right upright 32, or the strap 37

17 may be wrapped completely around both upright restraints

18 three-hundred and sixty (360) degrees and fastened a buckle on

19 upright restraint 30 to further secure the infant within the

20 upright restraints when in use. In alternative hook and loop

21 fastener constructions, a strap of loop material may be fastened

22 on upright restraint 30, and hook material may be fastened on

23 upright restraint 32. The strap of loop material may merely be

1 fastened over upright restraint 30 to the hook material on  
2 upright restraint 32, or may continue around and be further  
3 fastened to hook material on the reverse side of the strap.

4 [0031] Figure 8 illustrates shield and indicator device 75 in  
5 isolation. The shield and indicator device 75 is mounted on the  
6 top 50 and the opposite side of child 5 from the film positioner  
7 60. Indicia plate guide 70 secures a shield such as lead plate 73  
8 by another pass through friction fastener, such as dial knob 80  
9 with threaded shaft 81 passing through groove 76 on mounting  
10 plate 72. The threaded shaft 81 passes through opening 71 on  
11 guide 70, and into or through threaded opening 79 shown in a  
12 block attached to the side of top 50. Twisting the dial knob 80  
13 thus increases or decreases friction between the knob 80 and the  
14 mounting plate 72 against guide 70. Lead indicia markers 74 and  
15 cast resin pieces are rotated to expose a position reading over  
16 lead plate 73 thereby providing relevant position information on  
17 an X-ray photograph. The mounting plate 72 may be adjusted to  
18 position the lead shield 73 to protect the reproductive organs of  
19 the child 5 being X-rayed or imaged.

20 [0032] Figure 9a shows the lock 91 on top 50 disengaged from  
21 the carousel 16. Lock hole 90 is shown outlined on the carousel  
22 16 with the lock shaft 92 positioned for entry upon lifting of

1 lock tab 93. Figure 9b shows the lock 91 engaged into the  
2 carousel 16 with the lock shaft 92 penetrating the lock hole 90  
3 and the lock tab 93 lifted to a closed position.

4 [0033] Although a preferred embodiment of the present  
5 invention has been disclosed herein, it will be understood that  
6 various substitutions and modifications may be made to the  
7 disclosed embodiment described herein without departing from the  
8 scope and spirit of the present invention as recited in the  
9 appended claims.